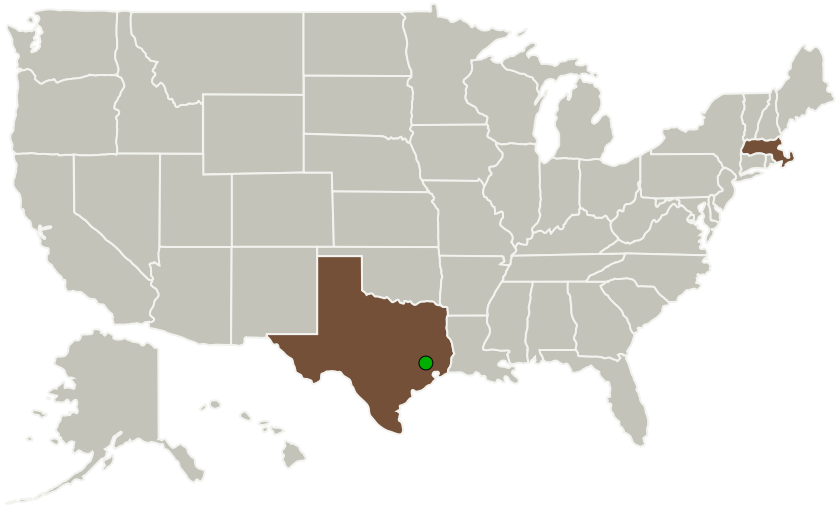
Passive Set-Point Thermal Control Skin for Spacecraft, Phase I

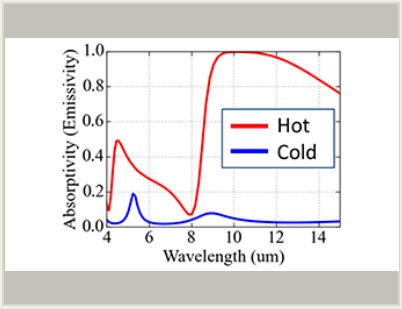
Completed Technology Project (2017 - 2017)

Project Introduction

Current manned and unmanned spacecraft require sophisticated thermal control technologies to keep systems at temperatures within their proper operating ranges. Future manned and unmanned missions to the moon, mars, and other destinations will require new technologies to maintain spacecraft temperature near a set-point while under variable heat loads and thermal environments under increasingly stringent size, weight and power constraints. Passive components that can assist with this goal can greatly extend and expand NASA mission capabilities. Physical Sciences Inc. proposes to develop a passive thermal skin with set-point temperature control using phase-change-material nanofilms. Our innovation will allow for simultaneous control of the visible reflectivity and the infrared emissivity of the spacecraft, causing the craft to reflect sunlight and radiate heat when hot, and absorb sunlight and become non-emissive when cold. By simultaneously optimizing both the visible and infrared optical properties, a turn-down ratio (TDR) of 18:1 is ultimately achievable.

Primary U.S. Work Locations and Key Partners





Passive Set-Point Thermal Control Skin for Spacecraft, Phase I Briefing Chart Image

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Small Business Innovation Research/Small Business Tech Transfer

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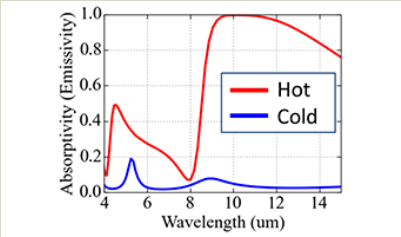
Organizations Performing Work	Role	Type	Location
Physical Sciences, Inc.	Lead Organization	Industry	Andover, Massachusetts
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Massachusetts	Texas

Images



Briefing Chart Image
Passive Set-Point Thermal Control Skin for Spacecraft, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/136352)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Physical Sciences, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

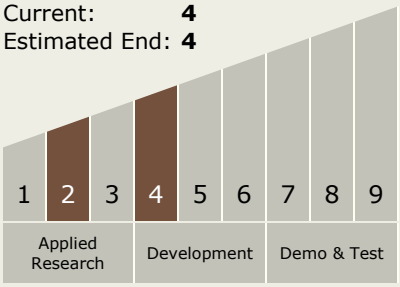
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
David N Woolf

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.3 Heat Rejection and Storage